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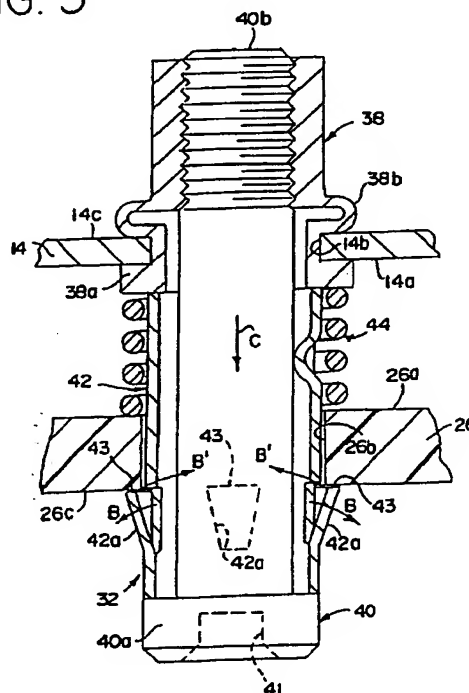
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(54) Air bag inflator module for snap-on attachment to a steering wheel

(57) An air bag module base (14) is connected to a support (26) on a steering wheel by means of at least one snap-engaged fastener (32). Each fastener (32) includes a bolt (40) with a threaded shank (40b) and a threaded sleeve (38) engaged therewith and permanently secured to the base (14) by a deformed flange (38a). Locking tabs (42a) which project outwardly from a sleeve (42) surrounding the bolt shank are deformed inwardly as the fastener is forced through an aperture (26b) in the support (26) and snap outwardly on passing therethrough. A metal compression coil spring surrounds the sleeve (42) urging the base (14) and support (26) apart preventing rattling. The spring may alternatively be of rubber and not positioned around the fastener (32). Unscrewing the bolt (40) from the sleeve (38) permits the fastener to be resecurably released.

FIG. 3



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Description

The present invention relates to air bag inflators generally and more particularly to an air bag inflator module which can be quickly mounted in place on a vehicle steering wheel or other support in a motor vehicle without requiring the use of tools utilizing quick-acting or snap-on fasteners or permanent attachment, and including a release system so that the module can be removed for service and/or replacement. The present invention is particularly designed for providing easy and quick mounting of an air bag inflator module on a vehicle steering wheel by merely pushing the air bag module into place until fasteners are locked to permanently secure the module to the steering wheel. The fasteners permanently retain the air bag module in place and are well able to withstand shock forces, velocities and stresses during air bag deployment. The fasteners are releasable using an ordinary hand tool so that the air bag module may be removed from the steering wheel or other support for service and/or replacement, and thereafter the module can be remounted or reinstalled on the vehicle support, again using only an ordinary hand tool such as a screw driver.

A break-away fastening system for air bag deployment doors is disclosed in copending U.S. patent application Serial No. 08/286,823, filed August 5, 1994. The fasteners utilized in the fastening system disclosed are designed to fracture upon air bag deployment so that the doors are released to open whereas the fasteners of the present invention are designed to retain the whole air bag inflator module in place on the steering wheel or other supporting element during air bag deployment, but are manually releasable when desired, so that the air bag module may be removed for service and/or replacement.

The present invention has an object to provide a new and improved air bag inflator module adapted for quick action, snap-on mounting or attachment to a vehicle support or steering wheel without requiring the use of tools.

It is another object of the present invention to provide a new and improved air bag inflator module of the character described which can be released from attachment after mounting in place so that the inflator can be removed for service and/or replacement.

Yet another object of the present invention is to provide a new and improved air bag inflator module of the character described which can be permanently mounted on a vehicle steering wheel by pre-positioning the air bag module directly in front relative to a steering wheel or other support in a motor vehicle and then merely pushing the module into place to lock snap-on fasteners for permanently securing the air bag inflator module in place.

Still another object of the present invention is to provide a new and improved air bag inflator module of the character described employing fasteners which can be released with an ordinary hand tool such as a screw

driver for permitting the air bag inflator module to be removed for servicing and/or replacement.

Yet another object of the present invention is to provide a new and improved air bag inflator module of the character described which can be reattached or remounted on the vehicle support after removal using an ordinary hand tool such as a screw driver.

Yet a further object of the present invention is to provide a new and improved air bag inflator of the character described wherein a fastening system for attaching or mounting the air bag inflator module on the vehicle steering wheel or other support is strong enough to withstand shock forces, velocities and stresses developed during air bag deployment and positively retain the module in place.

The foregoing objects and advantages of the present invention are accomplished in a new and improved air bag inflator module adapted for quick action, snap-on, permanent mounting or attachment onto a support provided in a motor vehicle such as a steering wheel. Installation of the inflator module requires the use of no tools for permanent installation on the support and the module includes a base facing and movable in one direction directly toward the support for establishing a permanent fixed attachment thereto. A fastening system including a plurality of quick action, snap-on type fasteners is provided extending between the base and the vehicle support for securing the inflator module permanently locked in place. The base of the module or the vehicle support is provided with openings for receiving a first portion of the fasteners extended therethrough as the inflator module is pushed into place on the steering wheel with a unidirectional thrust. Each fastener includes a second portion permanently mounted on the base or the support opposite an opening for supporting the first portion of the fastener projecting outwardly thereof. A snap-action holding or locking device is provided on the first portion of each fastener for engaging an opposite surface on the base or the support, as the case may be, after the first portion of the fastener is inserted through an opening. The holding device expands after insertion to engage the opposite side of the base or vehicle support for permanently retaining the fastener in interconnecting relation therebetween. Each fastener is releasable using an ordinary hand tool such as a screw driver for disconnection of the first and second portions thereof for permitting the inflator module to be bodily removed or detached from the support. Thereafter, the module can be reattached or remounted on the support again using an ordinary hand tool for interconnecting the first and second portions of each fastener.

For a better understanding of the present invention, reference should be made to the following detailed description taken in conjunction with the drawings, in which:

FIG. 1 is a cross-sectional view of a new and improved air bag inflator module designed for quick

action, snap-on permanent mounting or attachment onto a vehicle support or steering wheel constructed in accordance with the features of the present invention and illustrated as it is pre-positioned adjacent a vehicle steering wheel ready for mounting thereon with a unidirectional push or thrust;

FIG. 2 is a cross-sectional view illustrating the air bag inflator module after being permanently mounted in place on the steering wheel; and

FIG. 3 is an enlarged, fragmentary cross-sectional view taken substantially along line 3-3 of FIG. 2 illustrating one of the fasteners of the fastening system of the inflator module after mounting on the vehicle steering wheel.

Referring now more particularly to the drawing, in FIGS. 1 and 2 is illustrated a new and improved air bag inflator module 10 constructed in accordance with the features of the present invention. The inflator module 10 includes a housing 12 having an annular base 14 joined around the periphery with a side wall 16 forming a protective enclosure for a folded up inflatable air bag 18. At an outwardly facing peripheral edge the housing side wall 16 is joined with a frangible cover 20 designed to open when the air bag 18 is rapidly inflated. Centrally located on the annular base is an inflator canister 22 containing solid gas generant material and having a plurality of gas discharge ports 24 arranged in a ring designed to rapidly discharge the gas that is generated to rapidly inflate the air bag 18 in an emergency.

In accordance with the present invention, the air bag inflator module 10 is designed to be quickly permanently mounted or attached onto a support plate or support elements 26 provided on a steering wheel 28 of a motor vehicle or other vehicle supporting element such as a peripheral edge portion around a panel opening when provided for a passenger side type of inflator module. The support elements 26 extend from a central hub portion 30 inside of an outer rim 31 of the steering wheel 28 and provide surfaces 26a directly facing an outside surface 14a of the housing base 14 as shown in the drawing in FIGS. 1 and 3.

In accordance with the present invention, the air bag inflator module 10 is designed to be permanently mounted or attached to the support elements 26 of the vehicle steering wheel 28 by first pre-positioning the module with the base 14 directly facing the support elements 26 (FIG. 1) and then without requiring any tools, pushing or thrusting the module 10 toward the central portion of the steering wheel in one direction generally normal to surfaces 26a and 14a as indicated by the Arrow "A" in FIG. 1 until reaching the fully mounted position of FIG. 2.

In order to secure the air bag inflator module 10 in place as shown in FIG. 2, there is provided a fastening system including a plurality of elongated fasteners 32 (FIG. 3) extending directly between the base 14 and the support elements 26 and aligned generally normal or

perpendicular to the surfaces 14a and 26a. Preferably, the fasteners 32 are spaced equilaterally around a central axis 34 of a steering column 36 supporting the steering wheel 28.

The base 14 of the air bag inflator module 10 is formed with a plurality of openings 14b, one for each fastener 32, and the support elements 26 are provided with matching openings or apertures 26b as best shown in FIG. 3. Each fastener 32 comprises a quick-acting, snap-on, unidirectional, self-locking type employing an internally threaded, open-ended hollow sleeve or base 38 fixedly mounted and secured against rotation on the base 14 in an opening 14b and held in place by an end flange 38a facing the adjacent support surface 26a and a radially outwardly projecting upset ring 38b formed to engage an opposite side or inside surface 14c of the module base 14. One suitable type of sleeve or base 38 is manufactured and sold under the trademark RIVNUT and known as a rivet nut, however, other types of nuts with an internally threaded central bore and fixedly attached to the base 14 by staking or welding may be used. Each fastener 32 also includes a bolt 40 having an enlarged head 40a at one end and an elongated, threaded shank 40b of smaller diameter threadedly engaged with the internally threaded fixedly mounted base or sleeve 38. The bolt head 40a is formed with a slot or recess 41 in the outer surface for receiving the tip of a screw driver used for tightening or loosening the bolt 40 in the sleeve 38 when required. The head 40a has a diameter less than that of the opening 26b in the support elements 26 so as to easily pass through the opening.

Between the underside of the head 40a and the flange 38a of the base sleeve 38, each fastener 32 is provided with a generally cylindrical, hollow metal tube or sleeve 42 surrounding the threaded shank 40b and formed with a plurality of equilaterally spaced, upwardly and outwardly sloping locking tabs 42a (as viewed in FIG. 3) struck from the body of the sleeve in a region adjacent the head of the bolt 40. A coiled compression spring 44 may be mounted on the sleeve 42 to prevent rattle and has one end bearing upwardly against the flange 38a and an opposite end bearing downwardly against the surface 26a of the support elements 26 for biasing these elements and the base 14 away from one another. The spring 44 has an outer diameter larger than that of the opening 26b of the support elements 26 so that the spring will not move into the opening when the fastener 32 is thrust toward the steering wheel 28 during mounting of the air bag module 10 in place.

In accordance with the present invention, the locking tabs 42a normally extend radially outwardly to an extent greater than the inside diameter of the opening 26b and the tabs are compressed radially inwardly (Arrows "B") as the fasteners 32 are thrust (Arrows "C") into the openings 26b of the support elements 26 until upper free edges 43 of all tabs are past or on opposite surface 26c or back side of the support elements. At this time the tabs 42a are free to snap back radially out-

wardly (Arrows "B") to the locking or holding position as shown in FIG. 3 wherein the upper edges 43 positively engage the back side surface 26c of the support elements 26 to lock and hold the air bag module 10 permanently in place as shown in FIGS. 2 and 3.

It is thus seen that the fasteners 32 provide for permanent attachment or mounting of the air bag module 10 on the steering wheel 28, with a simple unidirectional thrust (Arrow "A") until all of the tabs 42a snap into locked position. The springs 44 which are made of metal or a polymer rubber prevent rattle and can be located elsewhere on the module 10 such as the corners between the base 14 and the support element 26. The springs 44 maintain tension on the fastener bolts 40 to prevent rattling and ensure that locking engagement of the tabs 42a and the support elements 26 is maintained. Moreover, the fasteners 32 provide sufficient holding strength so that when the air bag 18 is deployed to inflate the module base 14 and components mounted thereon remain in place on the steering wheel 28.

After initial mounting of the air bag inflator module 10 onto the vehicle steering wheel 28 as previously described, if it is desired to disconnect, release and remove the module for service, repair and/or replacement, each fastener 32 may be disassembled or released by unthreading the bolt 40 from the fixed sleeve or nut 38 using only an ordinary screw driver by turning the bolt until completely unthreaded from the sleeve. After all of the fasteners 32 have been so disassembled, the air bag inflator module 10 can be easily removed from the steering wheel 28. If after such removal is completed, another or the same air bag inflator module 10 is to be reassembled or mounted on the steering wheel 28, remounting or reinstallation is readily accomplished with an ordinary screw driver applied to turn the heads 40a of the bolts 40 until the threaded shanks 40b engage the internally threaded fixed sleeves or nuts 38 to the relative position shown in FIG. 1. Once this is done, the module 10 is again thrust into place as shown by arrow A to the position shown in FIG. 2 and is again positively secured in place on the steering wheel 28. To accommodate and provide access to the heads 40a of each fastener 32 for a screw driver, a back portion of the steering wheel 28 is formed with an access opening 46 coaxially aligned with each fastener.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. Thus, it is to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described above.

Claims

1. An air bag inflator module (10) adapted for attachment onto a support (26) provided in a motor vehicle, said module including:

a base (14) facing and movable toward the sup-

port for fixed attachment thereto; and

at least one fastener (32) extending between said base and the support, one of said base and the support having an opening (26b) for receiving a first portion (40b, 42) of said at least one fastener extended therethrough and the other of said base and the support having a second portion (38) of said at least one fastener permanently mounted thereon for supporting said first portion projecting outwardly of said one of said base and the support, holding means (42a) on said first portion of said at least one fastener for engaging a surface (26b) of said one of said base and the support after extension of said first portion of said at least one fastener through said opening for retaining said at least one fastener in interconnecting relation between said base and the support, and release means (41) for disconnecting said first and second portions of said at least one fastener for permitting said inflator module to be detached from said support.

2. The module (10) of claim 1 further including resilient spring biasing means (44) mounted between said base (14) and the support (26) having opposite ends bearing directly or indirectly against said base and the support for urging said base and the support apart after said holding means (42a) is engaged for prevention of rattling.
3. The module (10) of claim 2, wherein:
said biasing means (44) comprises a metal spring.
4. The module (10) of claim 2, wherein:
said biasing means comprises a rubber spring.
5. The module (10) of claim 2, 3 or 4 wherein:
said biasing means (44) is mounted on said first portion (40b, 42) of said at least one fastener (32).
6. The module (10) of any one of claims 1 to 5 wherein:
said holding means (42a) is compressible in order to pass through said opening (26b) and is expandable after passage therethrough to move into engagement with said surface (26c).
7. The module (10) of claim 6, wherein:
said holding means (42a) is compressed by passage through said opening (26b) in one direction and is expanded after said passage to prevent withdrawal in an opposite direction.
8. The module (10) of any preceding claim, wherein:
said holding means comprises a hollow

cylindrical sleeve (42) on said first portion (40b) of each fastener (32) with an end portion having at least one spring tab (42a) struck outwardly of a body thereof to normally project radially outwardly until compressed, said at least one spring tab having a free edge (43) for holding engagement against said one of said base and the support. 5

9. The module (10) of claim 8, wherein:

a plurality of said tabs (42a) are provided in a spaced apart equilateral array around said body of said cylindrical sleeve (42), said tabs being compressible radially inwardly during passage of said first portion (40b) of said at least one fastener (32) through said opening (26b) and snapping radially outwardly into a locking position after said free edges (43) of said tabs have passed through said opening. 10 15

10. The inflator (10) of claim 8 or 9, wherein: 20

said free edges (43) of said tabs (42a) extend outwardly beyond adjacent edges of said opening (26b) before and after passage there-through. 25

11. The module (10) of any preceding claim, wherein:

said release means comprises threads on said first portion (40b) engageable with threads on said second portion (38) of each fastener (32) whereby relative rotation of said threads causes said first and second portion to move toward and away from each other. 30

12. The module (10) of claim 11 wherein:

said second portion includes a hollow internally threaded sleeve element (38); and said first portion includes an elongated threaded bolt element having a shank (40b) in threaded engagement with said threaded sleeve element. 35 40

13. The module (10) of claim 11 or 12, wherein:

said first portion (40b) of each fastener (32) is provided with receiving means (41) for accommodating a tool engageable therewith for rotating said threads thereof relative to said threads of said second portion (38). 45

14. The module (10) of any preceding claim in combination with said support (26), wherein: 50

said second portion (38) of said at least one fastener (32) is fixedly mounted on said base (14); and

said opening (26b) is provided on said support (26) for receiving said first portion (40b) of said at least one fastener therethrough. 55

FIG. 2

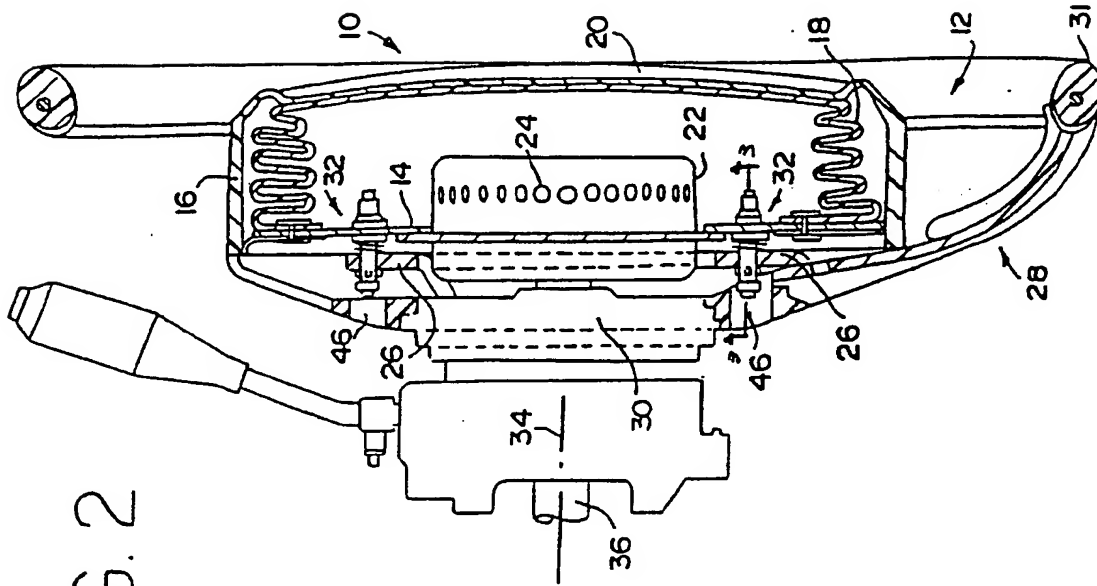


FIG. 1

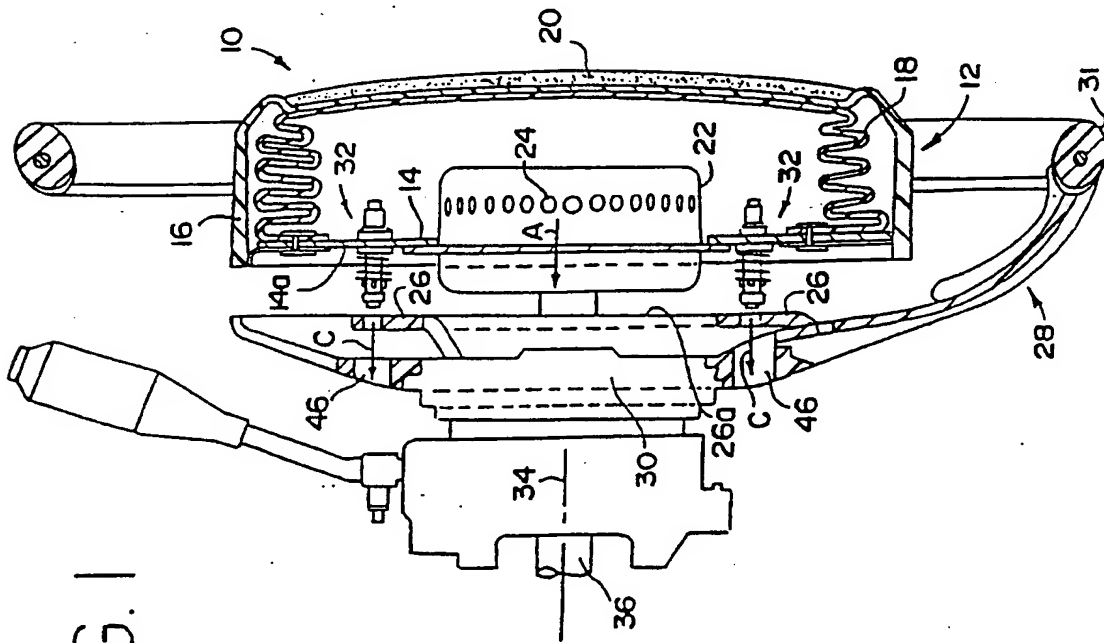
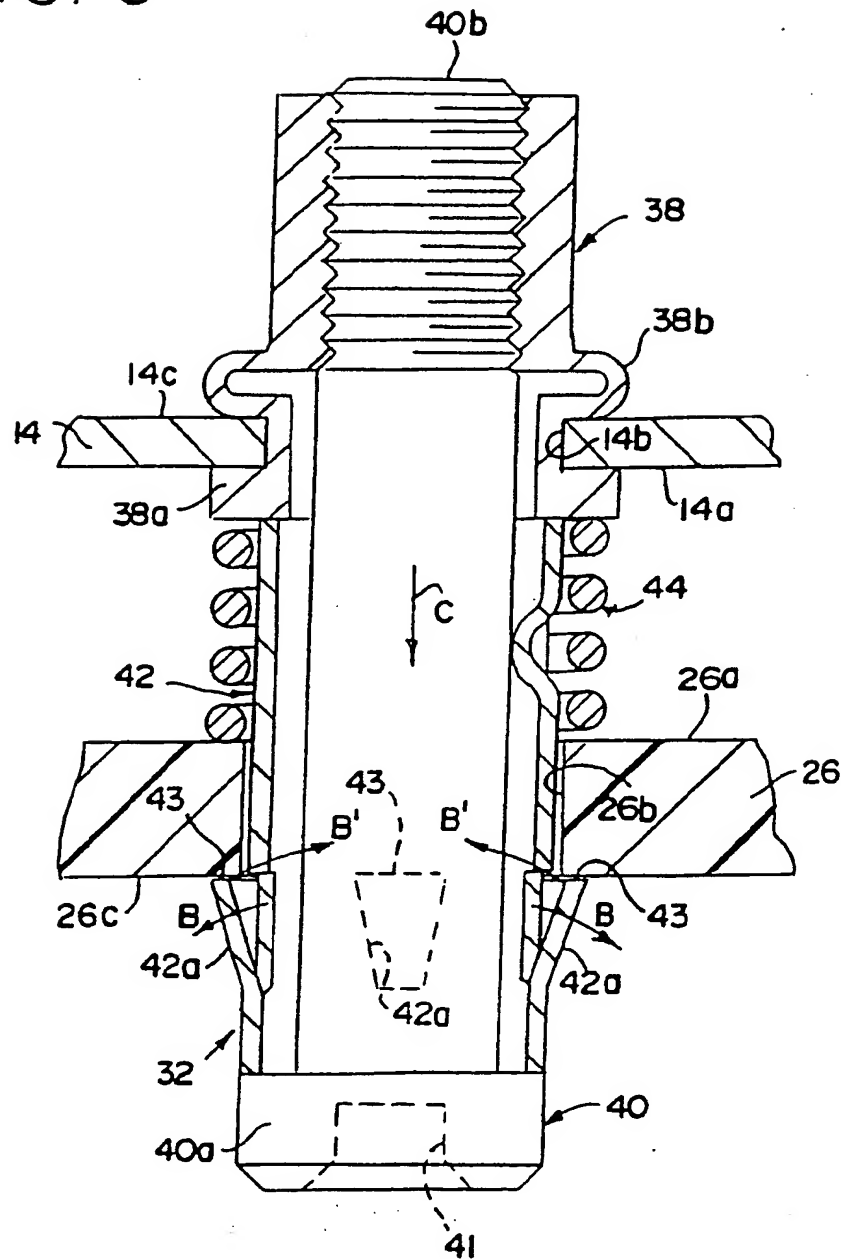


FIG. 3





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 5102

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	DE-U-94 02 753 (CAMLOC GMBH) * the whole document *	1,2,5-7, 11-14	B60R21/20 F16B21/08 F16B35/00
A	---	8-10	
Y	US-A-5 186 591 (J.B. MALKS) * column 1, line 48 - column 2, line 4 * * column 3, line 51 - column 4, line 2; figure 1 *	1,2,5-7, 11-14	
A	DE-A-42 31 787 (ITT AUTOMOTIVE EUROPE GMBH) * claims 1,11,12 * * column 3, line 4 - line 55; figures 1-3 * * column 4, line 13 - line 27; figure 8 *	1,6,7, 11-14	
A	US-A-5 333 897 (LANDIS ET AL.) * column 2, line 53 - column 4, line 52; figures *	1-3,5-7, 14	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	DE-A-34 33 941 (B.M.W. AG) * page 3, line 23 - page 4, line 35 * * page 5, line 32 - page 6, line 31; figures 1,2 * * page 7, line 25 - line 32 *	1,2,4, 11-14	B60R F16B
A	AU-B-432 592 (SIDNEY COOKE FASTENERS PTY, LTD) * page 5, line 8 - line 12; figures 3,4 * * page 7, paragraph 1 - paragraph 3 *	6-10	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15 November 1996	Examiner Dubois, B
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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